USING THE SILVER BULLET TO GET TO THE ROOT OF THE PROBLEM

By Dr. Jo Handelsman

One of the greatest challenges of the plant pathologist is to quickly and accurately diagnose disease. We usually start with a sick plant that has some generic symptoms: brown, yellow or wilted leaves, stem lesions, rotting roots. . . . . .In all, not very informative about the causal agent. To identify the agent that is responsible for the symptoms, and prescribe an appropriate treatment, laborious microscopy, culturing, and plant inoculations are used. Often, the diagnosis takes days or weeks to complete. By then, the patient may be dead and may have spread the disease to its neighbors.

Imagine if, instead of these slow methods, we could simply drop the sick plant into a liquid, shake it up, and WHAMMO!!! the liquid would turn a different color depending on which pathogen was present. How quickly we could nip diseases in the bud with the right treatment if we could complete a diagnosis in a few minutes, instead of a few weeks.

Many plant pathologists are developing such rapid diagnostic methods. The major tool that we have available is the monoclonal antibody. This is an antibody, developed in a mouse, that has exquisite specificity for a particular plant pathogen—either viral, bacterial or fungal. Because of their high degree of specificity, monclonal antibodies have been dubbed, "Silver Bullets." In a diagnostic assay, if the silver bullet finds its target, then the assay mixture turns a characteristic color.
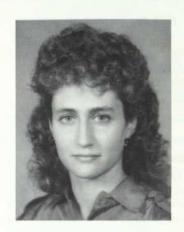
Monoclonal antibodies are made by an interesting process. Mammals contain an immune system that involves antibodies that recognize foreign invaders. If an animal is injected with a plant pathogen, it will mount an immune response to the pathogen. This will involve turning on the synthesis of antibodies in specialized cells called "B cells," which are present in the spleen. The problem faced by the plant pathologist is how to separate the antibodies against the plant pathogen from all of the antibodies in the animal. An ingenious solution to this problem was developed in the '70's. A group of scientists found that, instead of trying to purify the antibody, they could purify the individual B cells that produce the antibody of interest, since each B cell can only produce a single antibody. The B cells are fused with cancer cells so that they can be grown in culture in the laboratory. The fused cells secrete the antibody, which can be collected and used to assay for plant pathogens.

Monoclonal antibodies have been called the Silver Bullets for a variety of medical uses. They are being used to tag tiny packets of medicine that are delivered to particular cells in the body, such as cancer cells. By putting such an "address" on the medicine, it can be targeted to the cells of interest and won't go to other cells in the body that it might harm. Monoclonal antibodies are also used to detect miniscule amounts of proteins in the blood that can be indicative of diseases, abnormal conditions, or pregnancy.

Now it is time for the plant pathologists to use the silver bullets to diagnose diseases simply and rapidly. The tests may be so easy to perform that the grower could perform the diagnosis with a kit, and treat the disease accordingly. The next few years will bring exciting changes in the way that plant disease diagnosis is performed, and monclonal antibodies, the silver bullets of modern biology, will play an important role in these changes.

Editor's Note: Dr. Jo Handelsman joined the Plant Pathology Department last year as an Assistant Professor. A native of the metropolitan New York City area, Dr. Handelsman received a B.S. degree from Cornell in 1979 and a Ph.D. from the UW—Madison in molecular biology in 1983. She studies the genetics and biochemistry of specificity and the antagonism of bacterial pathogens.

THE STATE OF THE ART OF TURF DISEASE DIAGNOSIS OR IS THERE DISPAIR IN THE PLANT PATHOGEN DETECTION CLINIC?

By Mary Francis Heimann, O.S.F.

There are two crops that most diagnosticians dread the most. One of these is turf. Diagnosis of turf diseases is almost like Russian roulette; sometimes after hours of work on a specimen we would like a to take a pistol to our heads; provided, of course it is loaded with water. A good drenching washes away sweat and tears of exasperation.

Since this is for the "Grass Roots" publication let me start with the roots. Usually they appear in one of three stages. They are: 1) brown and rotted, 2) white and healthy, and 3) half and half—some dead and some alive. If they fall into category 2, I can continue on to look at the crown. If the roots are rotted, I ask what could have caused this condition. The little fungus chomping away at